

## **Hypertension and herbal plant for its treatment: a review**

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### **ABSTRACT**

Hypertension is a chronic disorder characterized by a persistently elevated blood pressure exceeding 140/90 mmHg or greater. Many antihypertensive agents are used for treatment of hypertension like Thiazide, loop, and potassium-sparing diuretics, Calcium antagonists Angiotensin-converting enzyme inhibitors, Central  $\alpha_2$ -adrenergic agonists,  $\beta$ -adrenergic and  $\alpha_1/\beta$ -adrenergic antagonists, Peripheral  $\alpha_1$ -adrenergic antagonists, Peripheral adrenergic neuronal blocking agents, Central/peripheral adrenergic neuronal-blocking agent, Direct-acting vasodilators etc. But these drugs have some side effects like diuretics may cause muscle cramps, dizziness, extreme tiredness, dehydration, blurred vision, abnormal heart rate, skin rash, and others. Side effects caused by ACE inhibitors are cough, skin rash, vomiting, kidney failure, fever, sore throat, diarrhea, and others. Side effects come with the use of calcium channel blockers are fatigue, headache, diarrhea, constipation, skin rash, edema, and others. The use of medicinal plants for treatment of hypertension is very common because these remedies are easily available and low cost than novel pharmaceuticals. Herbs do not cause side effects like weakness, tiredness, drowsiness, impotence, cold hands and feet, depression, insomnia, abnormal heartbeats, skin rash, dry mouth, dry cough, stuffy nose, headache, dizziness, swelling around eyes, constipation or diarrhea, fever etc. Hence the present article focuses on different medicinal plants worldwide used for hypertension rather than on medications. The present literature emphasizes on causes for hypertension, its signs, symptoms, preventive measures as well as its safer options of treatments.

**KEY WORDS:** Hypertension, Primary and Secondary Hypertension, Antihypertensive agent, Medicinal plant.

### **1. INTRODUCTION**

According to WHO criteria hypertension means elevated blood pressure levels above 140/90 mmHg. [1] It has been named the “silent killer,” as it is asymptomatic and the major contributor or risk factor to cardiovascular morbidity and mortality [2]. In 2000, 26.4% of the world’s population suffered hypertension and it is predicted that this rate would increase by 60% in 2025 [3]. Hypertension is mainly of two types:

**Primary or essential hypertension (90-95%)** has no specific cause which may contribute to increase in blood pressure.

**Secondary hypertension(5-10%)** is caused by underlying diseases like renal damage, pheochromocytoma, muscular disorders etc. that affect the kidneys, arteries, heart or endocrine system [4]. Cardiovascular diseases have emerged as an important health problem in India. High blood pressure (BP) is a major risk factor and a better control can lead to prevention of 300,000 of the 1.5 million annual deaths from cardiovascular diseases in India. Poor adherence to medications is a major public health problem and remains one of the main unresolved issues in the management of hypertension [5]. A medicinal plant can be described as any plant in which one or more of its organs contain substances that can be used therapeutic purposes or which are precursors for the synthesis of useful drugs [6].

The Treatment of hypertension include Angiotensin converting enzyme inhibitors, Angiotensin II receptor antagonists, Alpha blockers, Beta blockers, Calcium channel blockers, Diuretics, Direct rennin inhibitors, Vasodilators have some side effects of like Dry cough, Dizziness, Swollen ankles, Tiredness, Depression, Insomnia, Impotence, Palpitations, Slow heartbeat, Constipation, Loss of taste, Headache, Gout, Kidney damage (rare). There is a great deal of scientific evidence to suggest that the use of carefully chosen herbal remedies and dietary supplements can help to lower blood pressure, as well as to improve the overall functioning of heart, arteries, and entire cardiovascular system. There are some advantages of natural medicine treatment over medicine such as:

- Natural therapy is comparatively cheaper than modern remedies and treatments.
- Complementary therapy is easily available.
- Unlike allopathic remedies, natural and traditional medicines using herbs, vegetables and fruits are free from any Unwanted, undesired side effects.
- Natural remedy does not produce any reaction unless intake of such medicine is not followed as per advice.
- Natural remedy is less likely to affect other bodily systems and hence comparatively safe.

- Natural remedies, being general daily health supplements, not only help in curing the main disease but also soothe other body systems.
- Holistic remedies help in rejuvenating and revitalising the human health.
- Rather than working precisely on signs and symptoms, natural herbal remedies treat the root cause. Thus, helps in terminating health ailment permanently.

According to a WHO report, about 70-80% of the world's population rely on non-conventional medicine mainly from herbal sources in their primary health care. It is especially in the developing countries where the cost of consulting a western style doctor and the price of medication are beyond the means of most people [7].

**Cause of hypertension:** The various causes of hypertension are discussed in table.1 [8,9].

**Table no.1. Various causes of hypertension**

<b>Hypertension type</b>	<b>Cause</b>
<b>Primary hypertension(essential hypertension)</b>	Increased sympathetic nervous system activity. Increased production of sodium-retaining hormones and vasoconstrictors. Deficiencies of vasodilators such as prostacyclin and nitric oxide. Inappropriate or increased renin secretion,resulting in increased production of angiotensin-II and aldosterone. Genetic predisposition.
<b>Secondary hypertension</b>	<b>Renal:</b> acute glomerulonephritis, chronic nephritis, polycystic disease, diabetic nephropathy and hydronephrosis <b>Endocrine:</b> Acromegaly, Hypothyroidism, Hyperthyroidism, Hypercalcaemia (hyperparathyroidism) <b>Adrenal:</b> <b>Cortical:</b> Cushing syndrome, primary aldosteronism, congenital adrenal hyperplasia, apparent mineralocorticoid excess (liquorice) <b>Medullary:</b> Phaeochromocytoma, Extra-adrenal chromaffin tumours, Carcinoid <b>Exogenous hormones:</b> estrogen, glucocorticoids, mineralocorticoids, sympathomimetics, tyramine- containing food, monoamine oxidase inhibitors <b>Systolic hypertension:</b> Increased cardiac output Aortic valvular insufficiency, Arteriovenous fistula, patent ductus arteriosus Thyrotoxicosis, Rigidity of aorta Iatrogenic hypertension <b>Pregnancy-induced hypertension</b> <b>Neurological disorders:</b> Increased intracranial pressure – brain tumours – encephalitis – respiratory acidosis

**Signs and symptom:** Symptoms of high blood pressure are headaches, catching your breath after exertion, ringing in ears, fatigue, heart palpitations, flushed face, nosebleeds, strong need to urinate often, blurry vision and dizziness<sup>[10]</sup>.

**Why herbal medicine used for treating hypertension:** Many antihypertensive agents are used for treatment of hypertension like Thiazide, loop, and potassium-sparing diuretics, Central  $\alpha_2$ -adrenergic agonists,  $\beta$ -adrenergic and  $\alpha_1/\beta$ -adrenergic antagonists Peripheral  $\alpha_1$ -adrenergic antagonists (Therapeutics), Peripheral adrenergic neuronal blocking agents, Central/peripheral adrenergic neuronal-blocking agents, Direct-acting vasodilators (Therapeutics), Angiotensin-converting enzyme inhibitors (Therapeutics), Calcium antagonists (Therapeutics), Tyrosine hydroxylase inhibitors, Angiotensin II receptor antagonists (Therapeutics). But these drugs have some side effects like diuretics may cause muscle cramps, dizziness, extreme tiredness, dehydration, blurred vision, abnormal heart rate, skin rash, and

others. Side effect caused by ACE inhibitors are cough, skin rash, vomiting, kidney failure, fever, sore throat, diarrhea, and others. Side effects come with the use of calcium channel blockers are fatigue, headache, diarrhea, constipation, skin rash, edema, and others. So, scientific studies suggest different lifestyle changes and use of appropriate herbal medicine in the treatment of hypertension. Included in these various lifestyle changes are stress reduction, limited alcohol intake, regular exercise, limited salt intake, proper diet, smoking cessation and use of appropriate herbals<sup>[11]</sup>.

Herbs do not cause side effect like weakness, tiredness, drowsiness, impotence, cold hands and feet, depression, insomnia, abnormal heartbeats, skin rash, dry mouth, dry cough, stuffy nose, headache, dizziness, swelling around eyes, constipation or diarrhea, fever or anemia alone and associated with pressure medicines. 100% natural herbs are completely safe<sup>[10]</sup>.

**Treatment with herbal remedies:** The following medicinal plants used in the treatment of hypertension.

**Table.2. Medicinal plants used for hypertension**

Plant name	Ayurvedic/common name	Part used	Antihypertensive & other beneficial effects	Reference
<i>Tropaeolum majus</i>	Indian Gress	Seed, leaf, flower	Antihypertensive	[12]
<i>Coriandrum sativum</i>	Coriander	Fruit	Antihypertensive, Dyspepsia	[13]
<i>Lepidium sativum</i>	Garden cress	Leaves	Antihypertensive, Diuretic	[14]
<i>Laelia autumnalis</i>	Autumn Flowering Laelia	Roots	Antihypertensive, Vasorelaxant	[15]
<i>Carom capticum</i>	Ajvan	Leaves	Antihypertensive, Antispasmodic	[16]
<i>Oleo europaea</i>	Olive tree	Leaves	Antihypertensive, Hypoglycemic, Antioxidant	[13]
<i>Tribulus terrestris</i>	Tribulus	Leaves	Antihypertensive, Vasodilator	[18]
<i>Mesona procumbens</i>	Vanilla	Seed	Antihypertensive	[19]
<i>Eucommia ulmoides</i>	Eucommi Bark	Leaves	Antihypertensive	[20]
<i>Phyllanthus urinaria</i>	Bhuiainla	Fruit, leaf, flower	Antihypertensive, Anti-inflammatory	[21]
<i>Elettaria cardamomum</i>	Cardamom	Fruit	Antihypertensive	[22]
<i>Agastache Mexicana</i>	Mexican Giant Hyssop	Bark	Antihypertensive	[23]
<i>Cuscuta japonica</i>	Japanese dodder	Leaves	Antihypertensive	[24]
<i>Laelia anceps</i>	The bull	Roots	Antihypertensive, Vasorelaxant	[25]
<i>Clerodendron trichotomum</i>	Glory Tree	Stem	Antihypertensive	[26]
<i>Cocos nucifera</i>	Coconut palm	Seed	Antihypertensive, Vasorelaxant	[27]
<i>Fritillaria ussuriensis maxim</i>	Spring wild flower	Bulb	Antihypertensive	[28]
<i>Periploca laevigata</i>	Periploca laevigata	Bark, Roots	Antihypertensive	[29]
<i>Guazuma ulmifolia</i>	Rudrakshi	Bark	Antihypertensive, Vasorelaxant	[30]
<i>Hibiscus sabdariffa</i>	Jamaica sorrel	Leaves	Antihypertensive	[31]
<i>Tanacetum vulgare</i>	Saunf	Leaf	Antihypertensive, Vasorelaxant	[32]
<i>Errachidia province</i>	Errachidia	Leaves	Antihypertensive, Diabetes mellitus	[33]
<i>Aronia mitchurinii</i>	Chokeberry	Fruit	Antihypertensive	[34]
<i>Borago officinalis</i>	Borage	Leaves	Antihypertensive, Vasodilator	[36]
<i>Cecropia pachystachya</i>	Ambay	Leaves	Antihypertensive	[37]
<i>Citrus limetta</i>	sweet lemon	Fruit	Antihypertensive	[38]
<i>Loranthus ferrugineus</i>	Benalu	Leaves	Antihypertensive, Vasodilator	[39]
<i>Lepechinia caulescens</i>	Pitcher Sage	Leaves	Antihypertensive	[40]
<i>Averrhoa arambola</i>	Starfrui	Leaves	Antihypertensive	[41]
<i>Leonurus cardiaca</i>	Guma	Aerial parts	Antihypertensive	[42]
<i>Eugenia uniflora</i>	Pinang	Leaves	Antihypertensive	[43]
<i>Erythroxylum gonocladium</i>	-	Aerial parts	Antihypertensive	[44]
<i>Cirsium japonicum</i>	Five flavour berry	whole plant	Antihypertensive, Hemorrhage	[45]
<i>Phyllanthus acidus</i>	Rai awla	Leaves	Antihypertensive	[46]
<i>Valeriana wallichii</i>	Valerian Jatamansi	Rhizome	Antihypertensive	[47]
<i>Allium sativum</i>	Garlic	Fruit	Antihypertensive, Vasopressor	[48]
<i>Astragalus complanatus</i>	Gurmar	Seeds	Antihypertensive	[49]
<i>Geum japonicum</i>	Daikon-sou	Leaves	Antihypertensive, Vasorelaxant	[50]
<i>Melothria</i>	Melon-gubat	Leaves	Antihypertensive, Antioxidant	[51]

<i>maderaspatana</i>				
<i>Cudrania tricuspidata</i>	Mandarin melon berry	Leaves	Antihypertensive, Renal dysfunction	[52]
<i>Achillea</i>	plumajillo	leaves	Antihypertensive	[53]
<i>Antrodia camphorata</i>	Niuchanchih	Fruiting bodies	Antihypertensive, Liver disease	[54]
<i>Panax ginseng</i>	Ninjin	Roots	Antihypertensive, Immunomodulator	[55]
<i>Sclerocarya birrea</i>	Marula	Stem-bark	Antihypertensive, vasorelaxant	[56]
<i>Solanum torvum</i>	Susumber	Fruits	Antihypertensive, Cardiac hypertrophy	[57]
<i>Graptopetalum paraguayense</i>	Ghost plant	Leaves	Antihypertensive	[58]
<i>Echinodorus grandiflorus</i>	Corazon	Leaves	Antihypertensive, Anti-inflammatory	[59]
<i>Crocus sativus</i>	Saffron	Stigma	Antihypertensive	[60]
<i>Polyalthia longifolia</i>	Ashoka	Bark, Root	Antihypertensive	[61]
<i>Jatropha gossypifolia</i>	Red physic nut	Leaves	Antihypertensive, vasorelaxant	[62]
<i>Salvia cinnabarina</i>	Galeotti	Leaves	Antihypertensive	[63]
<i>Globimetula cupulata</i>	Guinea-bissau balanta	Leaves	Antihypertensive, Hypoglycemic	[64]
<i>Ulmus macrocarpus</i>	Large- fruited Elm	Root bark	Antihypertensive, Vasorelaxant	[65]
<i>Momordica charantia</i>	Bitter Melon	Whole plant	Antihypertensive, Diabetes	[66]
<i>Passiflora Edulis rind</i>	Passion fruit	Leaves	Antihypertensive, Vasodialator	[67]
<i>Harpephyllum caffrum Bernh</i>	Wild plum	Stem, bark	Antihypertensive, Diabetes	[68]
<i>Catharanthus roseus</i>	Vinca rosea	Leaves	Antihypertensive, Hypolipidemic	[69]
<i>Pleurotus nebrodensis</i>	White ferula mushroom	Fruit	Antihypertensive	[70]
<i>Saururus chinensis</i>	San bai cao	Root	Antihypertensive , Vasorelaxant	[71]
<i>Retama raetam Forssk</i>	White Weeping Broom	Leaves	Antihypertensive , Diuretic	[72]
<i>Gynura procumbens</i>	Akar Sebiak	Leaves	Antihypertensive	[73]
<i>Opuntia dillenii cladodes</i>	Sweet prickly pear	Leaves	Antihypertensive	[74]
<i>Mammea atricana</i>	Frican apple	Stem bark	Antihypertensive, Vasodialator	[75]
<i>Nigella sativa</i>	Black cumin	Seeds	Antihypertensive	[76]
<i>Calycotome villosa</i>	Spiny Broom	Leaves	Antihypertensive, Vasodialator	[77]
<i>Ekebergia capensis</i>	Dog plum	Leaves	Antihypertensive	[78]
<i>Coscinium fenestratum</i>	Gaertn	Leaves	Antihypertensive, Vasorelaxant	[79]
<i>Ficus exasperate</i>	Brahma's Banyan	Leaves	Antihypertensive, Anti-ulcer	[80]
<i>Buddleja crispa</i>	Himalayan Butterfly Bush	Leaves	Antihypertensive, Antispasmodic	[81]
<i>Gastrodia elata Blume</i>	Rhizomea Gastrodia Elatae	Rhizome	Antihypertensive	[82]
<i>Persea americana mill</i>	Avocado	Leaves	Antihypertensive, Cardiac dysfunction	[83]
<i>Hyptis fruticosa</i>	Alecrim-de-tabuleiro	Leaves	Antihypertensive	[84]
<i>Artemisia herba alba</i>	Armoise blanche	Leaves	Antihypertensive	[85]
<i>Raphanus sativus</i>	Radish	Leaves	Antihypertensive, Vasodialator	[86]
<i>Jacaranda mimosaeifolia</i>	Jacaranda	Leaves	Antihypertensive, Hypothermic	[87]

## 2. CONCLUSION

Hypertension, a worldwide illness, is a major factor in cardiovascular diseases that affects a large population of adults. Primary or essential hypertension is an elevated blood pressure due to an unknown or unidentifiable pathology. Secondary hypertension may be caused by underlying pathology or certain medication. Many allopathic drugs are used for treatment of hypertension. But these drugs have some side effect like muscle cramps, dizziness, extreme tiredness, dehydration, blurred vision, abnormal heart rate, skin rash etc. Herbal remedies are still widely used in world for the treatment of hypertension because herbal medicines are harmless as compared to allopathic medicines. The various medicinal plant which are used for the treatment of hypertension are discussed in table no.2. Certain traditional ayurvedic drugs like Terminalia chebula, Hibiscus species, Oryza sativa and other 20 species which are mentioned in the table no.2 are having equal demand in the current market scenario of India. As per our literature most of the plants belongs to lamiaceae, poaceae and acanthaceae families. It helps the scholars for their studies on herbal drugs.

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